

WHAT IS CLAIMED IS:

1. A combustion control device of an internal combustion engine, comprising:
  - a combustion adjusting device which adjusts a combustion-related element of the internal combustion engine;
  - a sensor which detects a parameter related to a specific gravity of a fuel burnt by the internal combustion engine; and
  - a programmable controller programmed to:
    - correct a target value of the element which has been defined with respect to a reference fuel, based on the parameter; and
    - control the combustion adjusting device so that the target value is realized.
2. The combustion control device as defined in Claim 1, wherein the combustion-related element is fuel injection, and the combustion adjusting device is a device which adjusts the fuel injection.
3. The combustion control device as defined in Claim 2, wherein the fuel injection adjusting device comprises a valve which controls the pilot injection amount and pilot injection timing of the fuel, and the controller is further programmed to control the valve to increase the pilot injection amount and retard the pilot injection timing when the specific gravity of the fuel is higher than a specific gravity of the reference fuel.
4. The combustion control device as defined in Claim 2, wherein the fuel injection

adjusting device further comprises a pressure control valve which controls a fuel injection pressure, and the controller is further programmed to control the pressure control valve to increase the fuel injection pressure when the specific gravity of the fuel is higher than a specific gravity of the reference fuel.

5. The combustion control device as defined in Claim 1, wherein the combustion-related element is a compression end in-cylinder temperature, and the combustion adjusting device is a device which adjusts the compression end in-cylinder temperature.

6. The combustion control device as defined in Claim 5, wherein the compression end in-cylinder temperature adjusting device comprises a turbocharger for supercharging an intake air of the internal combustion engine, the turbocharger comprising a variable nozzle and increasing a supercharging pressure of the intake air according to a decrease of an opening of the variable nozzle, and the controller is further programmed to decrease the opening of the variable nozzle when the specific gravity of the fuel is higher than a specific gravity of the reference fuel.

7. The combustion control device as defined in Claim 1, wherein the combustion-related element is an intake air swirl, and the combustion adjusting device is a device which adjusts the intake air swirl.

8. The combustion control device as defined in Claim 7, wherein the intake air swirl adjusting device comprises a swirl control valve which throttles an intake cross-sectional area of the internal combustion engine, and the controller is

further programmed to decrease an opening of the swirl control valve when the specific gravity of the fuel is higher than a specific gravity of the reference fuel.

9. The combustion control device as defined in Claim 1, wherein the sensor comprises a sensor which detects an intake air flowrate of the internal combustion engine, a sensor which detects a rotation speed of the internal combustion engine, a sensor which detects a load of the internal combustion engine and a sensor which detects an oxygen concentration of an exhaust gas of the internal combustion engine, and the controller is further programmed to:

supply fuel to the internal combustion engine according to a mass of the reference fuel determined based on the rotation speed and the load of the internal combustion engine;

calculate an air amount of an air-fuel mixture burnt by the internal combustion engine from the intake air flowrate and the rotation speed of the internal combustion engine;

calculate an air-fuel ratio of the air-fuel mixture burnt by the internal combustion engine from the oxygen concentration of the exhaust gas;

calculate a real fuel weight contained in the air-fuel mixture burnt by the internal combustion engine from the air-fuel ratio and the air amount of the air-fuel mixture; and

calculate the specific gravity of the fuel from the ratio of the real fuel weight and the mass of the reference fuel.

10. The combustion control device as defined in Claim 9, wherein the internal combustion engine comprises an exhaust gas recirculation device which recirculates

part of an exhaust gas of the internal combustion engine to an intake air thereof, and the controller is further programmed not to calculate the specific gravity of the fuel when the exhaust gas recirculation device is operating.

11. The combustion control device as defined in Claim 10, wherein the device further comprises a sensor which detects a temperature of the internal combustion engine, and the controller is further programmed to correct the target value of the element based on the specific gravity of the fuel and the temperature of the internal combustion engine, when the specific gravity of the fuel has been calculated.

12. The combustion control device as defined in Claim 11, wherein the controller is further programmed to correct the target value of the element based only on the temperature of the internal combustion engine when the specific gravity of the fuel has not been calculated.

13. A combustion control device of an internal combustion engine, comprising:  
means for adjusting a combustion-related element of the internal combustion engine;  
means for determining a specific gravity of a fuel burnt by the internal combustion engine;  
means for correcting a target value of the element which has been defined with respect to a reference fuel, based on the specific gravity of the fuel; and  
means for controlling the adjusting means so that the target value is realized.

14. A combustion control method for an internal combustion engine, the engine

comprising a combustion adjusting device which adjusts a combustion-related element of the internal combustion engine, the method comprising:

determining a specific gravity of a fuel burnt by the internal combustion engine;

correcting a target value of the element which has been defined with respect to a reference fuel, based on the specific gravity of the fuel; and

controlling the combusting adjusting device so that the target value is realized.